

COGNITION: HOW ELEMENTARY SCHOOL TEACHERS THINK ABOUT THINKING

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The purpose of this study was to identify the specific cognitive operations employed in today's elementary school classroom. This six year study, empirical in nature, collected data by:

(1) examining teachers' lesson plans for words which indicated specific cognitive operations and by (2) observing and recording classroom teachers' verbal statements which expressed subject matter expectations to learners.

During the past decade the State of Florida has provided all teachers training in questioning skills. "High" as opposed to "low" order thinking skills were emphasized. Principals reinforced and stressed the use of high order thinking skills through teacher evaluations. The assumption that trained teachers were more reflective and deliberate in implementing educational theory regarding cognition was examined in this study.

The results indicated that most teachers genuinely believed they were developing a variety of thinking skills. Analysis of their planning and classroom behavior indicated that teachers were vague in indicating specific cognitive operations and, in fact, repeatedly elicited the same set of memory expectations. Specific identification or reference to a variety of cognitive operations was almost non-existent.

This paper identifies possible reasons for the discrepancy between training in cognition and the lack of cognitive variety in the classroom.

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### Introduction

The concept within Reflective Teaching suggests that careful consideration be given to the act of teaching. The evolution and revitalization of any profession is grounded in a reflective process. Scrutinizing one's intent and actions by comparing, analyzing, making alterations, adjustments and designing new plans so as to accomplish more appropriate goals, aims and outcomes are essential for professional continuation and advancement. Rejecting a movement which encourages a reflective process is counterproductive. Of course, teachers should be reflective. Accepting the notion that all teachers are prepared and qualified to rely on a Reflective Teaching process in order to up-grade and enrich the classroom teaching experience is questionable. Reflective teaching requires a gestalt approach regarding the teaching/learning process. A broad knowledge-base, analytical skills and an ability to evaluate objectively are essential ingredients of the reflective process. Do teachers have these characteristics? The intent of this study was to examine only one dimension within the teaching/learning interaction which incorporates a reflective process - cognition. How do teachers approach this process of thinking? How do teachers accurately execute that upon which they have reflected?

## Cognition

Cognition - it's a primary reason children go to school. They "learn to think" - so we say. Data on American children's thinking development has not fared well for the last two or three decades (French & Rhoder, 1992). Why? It certainly is not because attention, time and money have not been provided to develop and refine thinking skills (Sowell, 1993). Conversations, workshops and research about thinking are frequent, even required, topics of study. This investigation examined the classroom to see to what degree the conversation, workshops and research have permeated the classroom. What kind of thinking skills were sought and developed in today's classroom?

"The professional literature on thinking is vast. It contains treatises on the nature of thinking, research on specific aspects of thinking and proposals for the teaching of thinking. The proliferation of ideas has, inevitably, produced a rich terminology that often conflicts in meaning and usage (Mosston & Ashworth, 1990, 10)." Teachers who are willing to study and expand their knowledge-base about various educational topics are often caught in theoretical and self-esteem contradictions. In workshop information delivery is frequently presented in vague generalities. These generalities and theoretical contradictions leave teachers to idiosyncratically select, interpret and define implementation procedures. This personalized application of new ideas often leads to unintentional violations of the theories they are attempting to

implement. Attending workshops can be a means to expand the self-esteem of teachers. By attending, workshops many teachers feel they are "keeping up to date" and the bitter attack on teachers is directed not at them, but others who refuse to update and study. Because "new" information is filtered through teacher's previous perceptions and knowledge-base, the "new" information often looks more similar to old behaviors than to the proclamations of the "new" theory. A professional surprise would occur if teachers were aware of the fact that minimal fidelity exists between theories studied and actual classroom implementation.

The literature provides data that supports the existence of a gap between intent and reality. Goodlad's study of 1000 classes concluded that there is "a lack of parallelism between what many other (state level) goal statements convey and what we observed in schools and classrooms (p. 235)." "What the schools in our sample did not appear to be doing in these subjects was developing all those qualities commonly listed under 'intellectual development' - the ability to use, evaluate and accumulate knowledge, a desire for further learning. Only rarely did we find evidence to suggest instruction likely to go much beyond mere possession of information to a level of understanding its implications and activities likely to arouse students' curiosity or to involve them in seeking solutions to some problem not already laid bare by the teacher or textbook (p. 236)." Further, Goodlad suggests that there is a likelihood "that most teachers simply do not know how to teach for

higher levels of thinking (p. 237)." Other researchers support Goodlad's findings. Alvermann and Hayes (1989) observed teachers' classroom behaviors, discussed with each teacher their teaching strategy and the degree of learner's cognitive involvement. After training to increase learner's cognitive activity, teacher's classrooms were observed again only to find that within time teachers reverted to their previous strategies. "Teachers have their own experiences, beliefs and intentions that are translated into practical arguments and instructional goals to which they are firmly committed (p. 333)." Stieglitz and Oehlkers (1989) found that teachers perceived they had fostered critical/analytic and creative/applied categories in their reading skills; yet, classroom analysis indicated only a two percent involvement in such cognitive activities by students. Training was provided to increase cognitive activity, but the findings remained the same - only a two percent critical/analytic and creative involvement occurred.

Gess-Newsome and Lederman (1991) investigated the relationship of five biology teachers' subject matter structure (intent) and classroom procedures (action) and found that only one teacher demonstrated congruence between intent and action. Using interview and videotaping, Marshall (1989) found a discrepancy between what teachers of literature thought discussion should be and what was the actual classroom discussion. Brief and unelaborated responses dominated in spite of their perceived perceptions of developing "...interaction of interested minds," "lead ..to ..closer analysis

of text," "develop confidence .. to formulate... ideas ... express ideas to peer group...(p. 10)."

As a local case in point, all teachers and principals in the State of Florida have been exposed to the Professional Orientation Program. This effective teaching, research-based competency program serves as the bases for the State-wide evaluation system (Domains, 1983). One section within the evaluation system focuses on cognition as it relates to, among others, Bloom's taxonomy with emphasis on higher order questions. Principals and teachers are "trained" in higher/lower order thinking skills. Principals overtly express their preference towards lessons which focus on higher order thinking skills. Teachers, principals and the educational community are versed in "talking" cognition. Yet, as this study will reveal, few higher-order thinking questions were elicited in the classrooms studied.

The focus of the Professional Orientation Program is to update teachers and principals on effective teaching practices so that these practices can and will be more readily observed in the classroom. Such a training program reinforces the notion that after study a reflective teaching process will be activated and result in effective implementation practices. With such training and administrative focus, it would seem appropriate to predict that cognitive development would be a deliberate emphasis in the classroom and congruence would exist between cognitive theory and

classroom practice. However, like previous studies this assumption did not withstand classroom analysis. What is cognitively stressed in today's classroom? Why are high-level cognitive experiences minimal in the classroom?

It is important to acknowledge the author's position that a distinction exists between the brain's capacities "to think" in a variety of cognitive operations and the belief that children learn to think only in school. The brain THINKS - whether in school or not. Cognitive development occurs whenever and wherever the brain thinks. School can make thinking more or less rewarding or even painful. "School thinking" generally requires students to "stop thinking" and to **re-focus thinking** to specific subjects, topics, or experiences for a particular period of time. Smith states that, "the most difficult kind of thinking is that which is imposed on us by someone else, when our own brain can be totally disconnected from what we are expected to be thinking about (p 27)." It takes disconnecting from "our" thinking to think about a specific topic. Grasping such a notion places more responsibility on teachers to design lessons that will engage students in WANTING to focus or re-focus their thinking attention.

It is necessary to state that this paper will not argue the existence or non-existence of higher-order thinking skills; or delve into the numerous theories about thinking; or suggest that pitting cognitive operations against another serves no purpose; or that by labeling cognitive operations as higher/lower we have created and perpetuated yet another stigmatizing schema, as Smith suggests in To Think that "higher-order thinking is a status term" (p 23). In addition this paper will not address the critical topic of quality subject matter presentation. As a by-product of this study it became clear that teachers showed a deficiency in their techniques, patterns, degree of content and knowledge-base about "presenting and delivering" subject matter. This area requires future study.

### **Procedures:**

This empirical study began as a college of education class assignment six years ago. Over the years, approximately three hundred public school classrooms were involved. Through observational and analytical assignments, college students at Florida Atlantic University concluded that many of the current findings concerning effective teaching characteristics were not identified with frequency in today's classrooms. Time-on-task, instructional talk as opposed to logistical talk, use of examples



and non-examples, variety of thinking skills, wait time, minimal discipline disruptions, specific feedback and other behaviors which correlate with high achievement were only minimally observed in the classroom (Ashworth, 1990). Eventually, a detailed and specific assignment evolved to focus primarily on cognitive expectations in the classroom. This task evolved after repeatedly asking groups of teachers to, "Name the cognitive operations you use in the classroom." Collectively, a list of ten or so operations were given. A second question asked teachers to, "Name cognitive operations you know but do not use in the classroom." Teachers generally could not name any additional cognitive operations! A possible assumption concerning their responses was: if they could name additional operations, they would have said they used them! Of the cognitive operations mentioned, to what degree do teachers implement them? Two sources for collecting data were used. One source involved, collecting teacher's "checked" lesson plans for a two week time period. (For the past several years in the State of Florida, teachers' lesson plans have been collected approximately every one or two weeks and checked by an administrator). In addition to collecting checked lesson plans, students were asked to, "Identify the specific cognitive operations by recording the verbal behavior used by teachers to set task expectations." The data collected from these questions shed light on the status of cognitive engagement in approximately three hundred classrooms studied over a six year period. Although similar empirical data has been observed on the middle and high school levels, this study

is solely restricted to the elementary classroom. Cognitive emphasis in the elementary classroom is the focus of this paper.

Data was gathered by:

- I. Examining teachers' lesson plans for two weeks and tallying the words that indicated the cognitive intention and
- II. Recording the verbal statements teachers made in the classroom when giving subject matter expectations to learners or when asking subject matter questions of learners

### **Results:**

A summary of the results indicated that teachers:

1. Seldom mentioned a specific cognitive operation
2. Used vague words to represent the intended cognitive operation
3. Used the same set of cognitive operations repeatedly when specific cognitive operations were stated

I. Lesson plan analysis produced findings in three different categories:

1. Identification of the most common Lesson Plan Format
2. Identification of different lesson plan writing-style preferences
3. List of cognitive operation words

One, generally all teachers used the same lesson plan book. Since each school selects and purchases their own Lesson Plan Book for each teacher, it is not surprising that teachers use the same format. Although individual schools purchase and distribute lesson plan books, it is not mandatory for teachers to use the designated book - All did.

The following illustrates the Lesson Plan Format most frequently used:

Content:	Math	Spelling	English	etc.	etc.
Day:					
Monday					
Tuesday					
Wednesday					
Thursday					
Friday					

In the counties bordering Florida Atlantic University, "Whole Language" and "hands-on" instruction have become the educational mandate for 1993. Teachers are finding that the above familiar lesson plan format is not desirable. Publishers no doubt will soon produce lesson plan books with a Whole Language format focus.

Two, three different writing-styles emerged, but the content and the information provided were more similar than different.

The following charts presents the three writing styles employed by teachers.

Design # 1	Design # 2	Design # 3
<p>Objective: to <u>learn</u> to spell core review and challenge words ending in ly, p 105.</p> <p>Objective: to <b>identify</b> adjectives and nouns they modify, p 216-217.</p>	<p>Objectives:</p> <ol style="list-style-type: none"> <li>1. Students will be able to <u>discuss</u> predator /prey relationships</li> <li>2. Students will <u>understand</u> the importance of adaptation in predator/prey relationships</li> <li>3. Students will <b>recognize</b> the limiting factors that affect wildlife populations</li> </ol>	<p>Subtraction with Regrouping: - pg. 38-39 - Teacher directed Worksheet 15 - Teacher Assisted - Home work Reteach Sheet #15</p>

Teachers following Design #1 specifically stated the subject matter topics and page numbers for all tasks. Almost all tasks included in Design #1 were textbook or worksheet driven. This lesson plan emphasis provides an "image" of the classroom - learners work individually, completing textbook or ditto tasks most of the day. Only occasionally, in Design #1 did lesson plans indicate that students would work "in groups" or "with a peer" to complete workbook tasks. Design #2 presented specific subject matter topics, but ambiguously stated the objectives to be accomplished, logistics and the manner in which the content would be delivered and acquired by students - "to discuss, will understand, will recognize." The lesson plan emphasis is vague; therefore, predicting the "image" - the teaching strategy - of this class is difficult. The teacher could "show and tell," or use situational activities, or hand-out dittos, or employ guided discovery strategies. A lesson plan is a road map. In Design #2, the exact destination and image of "how to" was not clearly delineated. In Design #3, brief, sketchy content and logistical procedures were provided - nothing more. What is being developed? How are learners to be engaged in the content? The "image" of the classroom, though vague, is probably similar to Design #1 due to the emphasis on logistics.

Lesson plans indicate that which teachers feel is important. The focus of education is to deliberately and specifically develop learners cognitively, socially, emotionally, physically and

ethically. Yet, specific reference to these Development Channels (Mosston & Ashworth, 1990) were omitted in all lesson plans. Content delivery and presentation were expressed by indicating page numbers and completing worksheets - only logistical emphasis appeared to be teacher's primary focus.

From the lesson plans, a list of words or phrases used to indicate cognitive intention were collected. All examples, except one, reinforced and emphasized memory based cognitive operations. Few specific cognitive words were indicated. To clarify some ambiguous task intentions, an examination of the designated page revealed that indeed memory responses were primarily required - matching, listing and recall fill-in the blanks.

The following list represents the collection of phrases which indicated cognitive intent as stated in the lesson plans.

## Lesson Plan - Cognitive Intent

go over new words... go over directions, page 103 ..  
do vocabulary game... do workbook page ... do Comprehension  
section, page 22-25,

write each spelling word..  
locate spelling words..  
practice modeling fractions..  
Unit Practice workbook page 5..  
draw community and explain..  
read/discuss story..  
learn to spell words..  
test..

have students answer questions..  
answer literal questions..  
choral read spelling words..

demonstrate ability to follow directions..  
listen to story..  
introduce page 97..  
review math ... review lowest terms..  
explain fractions..  
explain how igneous rocks are formed - ditto page 92..

identify cause and effect..  
identify the adjectives..  
identify, develop and draw appropriate conclusions..  
give examples of common minerals found in the earth's crust..  
define words..

spelling: meaning of words - brainstorm & use in sentence..  
make up sentences..  
interpret a bar graph, math test mastery..  
\*predict background knowledge for next story, page 30-37..

\* This example is the only one which indicated that the cognitive operation  
was other than memory based.

**Words expressing cognitive intentions in Lesson Plans were  
ambiguous and non-specific and only a minimal variety were  
employed.**

II. The recording of teacher's verbal statements which expressed subject matter expectations revealed that cognitive ambiguity frequently occurred. Not only were fuzzy cognitive intentions expressed in lesson plans, but also during verbal delivery of task expectations. ("You are going to - write, put, finish, complete, do - were the most common statements. Questions included who, what, why, when, or where). It appears teachers do not deliver or present subject matter nor do they verbally express specific cognitive intentions. Cognitive development is haphazard. Note: in most cases the quotes represented all that was said about the subject matter task.

## Verbal Statements - Indicating Cognitive Intent

- "Put the correct name of each state where it belongs on the map."  
"Take your mathematics book out and turn to page 96. Do this page and the back (page 97) now."  
"Look up the Greek gods in the encyclopedia. Answer why these things are happening as god said."  
"Using the sentence on the board as the beginning, write about the Christopher Columbus play we saw yesterday."  
"Get out your math books, turn to page.. Read the directions, John. Do like I showed you before. Do page 52 in your books. Then do the worksheet. I want you to think while you do this."  
"Finish the primary color ditto."  
"Work on this math by yourself without talking."  
"Open your math books to page..." The teacher explained the math procedures for the problems on page.. without ever referring to the opened book, then said, "Do all the problems."  
"There is a ditto on your desk (ditto was a bird cage cut-out). See what you can do with it. Copy the two sentences from the board into your bird notebook. Then complete workbook pages for English."  
"Name some Island names. .. We're going to make a map. I'm looking for this time to be creative - how hard you're trying"  
"I have 2 papers for you to do. One is to color the flag. Color it correctly. You must answer the questions on the bottom of the paper, all the answers are given on the top of the paper. Put your name on the paper."  
"Take out your pencils and paper. You are going to write a story."

After rotational reading, teacher stated, "Complete pages ... in your workbook."

- "Philip is going to read, let's all follow along."  
"Why did Adam continue to... in the story?"  
"In what way did the author present the character?"  
"What do you think was the plot ..."  
"Write in your journals, 'If I were a giant...'"  
"What do you think happened? ..Think again."

\*"What is electricity?"

\*"What are the parts of a book?"

\*(these topics were new for learners.. If learners could correctly answer this introduction question, they would not need the "lesson" on electricity or parts of a book.)

Again all verbal statements reinforced and emphasized memory-based cognitive operations. A relationship indeed appears to exist

between teacher cognitively vague lesson plans and their classroom action. Apparently, students spend most of their time practicing what they have already been exposed to. This study revealed teachers' reluctance to "present" subject matter, their tendency to focus on delivery of directions and logistics and their pre-occupation with memory cognitive operations.

### **Possible Reasons for Misconceptions about Cognitive Development**

#### **1. Cognitive Knowledge-base**

Teachers appeared to lack a comprehensive understanding about the structure of thinking. Jargon is known, but integrating that information into teaching was not evident. The Spectrum of Teaching Styles presents two "sets" of cognitive operations - Memory (Reproduction) and Discovery (Reproduction). Each set - memory and discovery - is comprised of many specific cognitive operations and each of these specific cognitive operations (generally speaking) has its own definition, uniqueness - its own "demands of the brain." Matching is different from interpreting; matching is different from summarizing or sequencing, or labeling. Each specific cognitive operation asks the brain to do a particular function within the content topic. Stating specific cognitive intentions gives learners a chance to develop, to be successful and gain confidence. General and ambiguously stated questions do not provide all learners with the opportunity to equally enter and engage in eliciting the answer. "Complete, finish, do, write, color, create, think, give your opinion, what, why, when are nebulous words which allow for choice and may lead to error or misunderstanding. Such verbal behavior produces haphazard cognitive development.



The following chart (Ashworth, 1993) presents the variety which exists within each cognitive set. This chart is incomplete - there are additional words in the English language that trigger specific cognition operations. Note: some words appear in both sets, when combinations of cognitive operations occur placement can be altered.

**COGNITIVE OPERATIONS - A POSSIBLE CLUSTERING**

**MEMORY**

OBSERVE	TRACE	BROWSE	DECODE	MEMORIZE	REPEAT	COPY
	TRACK			RECOGNIZE		EMULATE
LABEL	DEFINE	LIST	MATCH	LOCATE	SELECT	SORT
NAME				IDENTIFY		ESTIMATE
TELL	DESCRIBE	PROVIDE	CLUSTER	APPLY	REVIEW	CALCULATE
RESTATE		EXAMPLES	ORGANIZE		SUMMARIZE	MANIPULATE
EXPLAIN	CAUSE	EFFECT	REASON	COMPARE	CONTRAST	MAPPING
PARAPHRASE						ASSOCIATION
FRAME	REPORT	EXPRESS	CONCLUDE	OPINION...	"CREATIVE"*	

**DISCOVERY**

**COGNITIVE OPERATIONS THAT MOVE AWAY FROM MEMORY**

SEQUENCE	SELECT	MANIPULATE	COMPARE	CONTRAST	DISTINGUISH
ORGANIZE			PRO/CON		DIFFERENTIATE
CATEGORIZE	EXAMINE	INDUCE	CONCLUDE	SYSTEMATIZE	COMPILE
	RELATE TO		DRAW CONCLUSIONS		BUILD
ANALYZE	ILLUSTRATE	MAP	DRAMATIZE	DREAM	IMAGINE
				WONDER	SUPPOSE
DEBATE	REFUTE	INFER	PROPOSE	HYPOTHESIZE	COMPOSE
DEFEND		DEDUCE	REASON	SPECULATE	PLAN
SYNTHESIZE	FORMULATE	FORECAST	CONSTRUCT	CLASSIFY	
ASSOCIATION	PREDICTING	SPECULATE	DEVISE		
DESIGN	INVENT	PROBLEM	VERIFY	PRIORITIZE	RATE
MODEL	CONCEIVE	SOLVE		RANK	CRITICIZE
ARGUE	JUSTIFY	EVALUATE	ASSESS	VALUE ...	"CREATIVE"*
CONVINCE		JUDGE			

\*Creative = this word is an attribution about the "uniqueness" of an idea(s). The creative idea(s) stems from or is anchored in one or more cognitive operations from either memory **or** discovery.

Being able to distinguish the cognitive function and design activities to elicit the various cognitive operations is critical if teachers are to deliberately develop cognition. A teacher cannot use "just any verbal behavior" in hopes of developing different cognitive skills. Each operation has its own function, its own definition and its own verbal behavior (Mosston & Ashworth, 1990, 265). Knowledge precedes behavior. It is the professional obligation of teachers to know how to trigger questions which deliberately engage learners in cognitive development.

## 2. The Who, What, When, Where and Why Misconception

Teachers believe they are asking higher order questions when they include who, what, when, where, or why in questions.

Generally speaking, **Who, What, When, Where and Why:**

1. Are NOT words which project a **specific** cognitive operation
2. Are words which may represent either memory or discovery
3. Are words which provide individuals latitude in selecting the specific cognitive operation to answer the question. (This option often leads students to misconceptions, misunderstanding and confusion in eliciting a "desired" response)
4. Are words which require another word in the question or statement indicating the specific cognitive intent
5. Are questions which provide insight as to individual's cognitive preferences
6. Are questions that require flexibility and latitude when evaluating, if no specific cognitive operation is mentioned

Answers accepted as correct to questions which included these words elicited concrete, specific, memory responses. However, teachers believed they were asking higher order questions. This section is

not a statement against asking questions with who, what, when, where and why. The point is, to be aware of the implications of these words and to identify the objective before arbitrarily using these potential ambiguous words.

### **3. Program Confusion**

There is just so much from which to choose. Without a connection between theories, it is very difficult for teachers to discern the theoretical refinements. In a county in South Florida, teachers may choose from approximately 20 workshops which focus on cognitive development. Each workshop competes with the other. The connections among theories are lost and teachers are left to personalize the implementation process. This personalization of implementation reduces reliability and replication of theory.

### **4. Convenience**

Generally, a gap exists between what teachers know and what teachers do. Many teachers know how to implement tasks which require more than memory. However, the time and energy requirements are often more than some teachers choose to extend. Publishers' books are more convenient and accessible, even if these materials reinforce limited memory operations such as recall, fill-in the blanks, match, list or sequence. Such a school day seeks correct answers, being right or wrong, knowing or not knowing - remembering and memorizing. Whether learners work individually or in groups, they are striving to reproduce "The Answer." Convenience discourages experimentation and expansion.

The conclusions of this study indicate a neglect in deliberate

cognitive development in today's elementary classrooms. Misconceptions about accomplishments result from gaps in knowledge. Knowledge, reinforcement, accountability and a reflective process can alter teachers behavior. The premise of education is growth and modification. Both teachers and students expanded cognitive processes will benefit when teachers modify their thinking about thinking.

### **Conclusion**

Education is confronted by results which indicates that a discrepancy exists between theory and action. A reflective process serves to contribute to "What is good teaching?" and "How can the teaching profession - from conception to implementation - improve?" "Teaching is, indeed, a complex human activity. It requires considerable knowledge and skill in many areas of human development. It requires not only a wide range of subject matter knowledge, but also the sensitivity and insight to understand the state of each learner as a human being who moves, thinks, feels, judges, ponders, creates and connects with other humans. It is quite a challenge to a teacher to integrate all these dimensions during the moments of contact with the evolving learner. It is quite a challenge to be flexible and mobile...and thus to be able to exercise...options... (Mosston and Ashworth, p. 310)." Such demands require a reflective process. The success of the reflective teaching movement, like so many other good ideas in education, is ultimately based on the degree of understanding and knowledge teachers have about teaching.

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